# CARNIVOROUS PLANT NEWSLETTER

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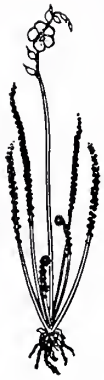

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Front cover: *Pinguicula planifolia.* Appalachicola National Forest. Photo by Don Schnell.

Rear Cover: *Pinguicula primuliflora* . Eglin Air Force Base, Florida panhandle. The plants are massed in the muck along a small stream as well as extending out onto the water surface. Photo by Don Schnell.

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President - Rick Walker, MS 26U4, P.O. Box 10350 , Palo Alto, CA, 94303-0867
Phone: (415) 856-2354 Email: walker@opus.hpl.hp.com
V. Pres. - Christoph A. Belanger, 88 Strathmore Rd. , Apt#4, Brookline, MA 02146
Phone: (617) 739-9795 Email: cbelan9630@aol.com
Sec/Treas - Kevin Snively, P.O. Box 1013, Everett Wa. 98206-1013
Phone: (206) 252-2911 Email: ksnive@premier1.net

**Coeditors**

D.E. Schnell, Rt. 1, Box 145C, Pulaski, VA 24301
J.A. Mazrimas, 329 Helen Way, Livermore, CA 94550
Steve Baker, Rt. 1, Box 540-19AB, Conover, NC 28613-(flytrap@twave.net)
Seed Bank: Tom Johnson, P.O. Box 12281, Glendale, CA 91224-0981- (tjjohns@primenet.com)
Business Manager: Leo C. Song, Jr. (leosong@fullerton..edu)

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# The Savage Garden

## "Mini-Bogs"

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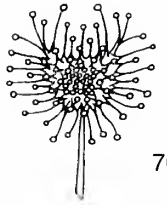

by
Peter D'Amato
California Carnivores
7020 Trenton-Healdsburg Road
Forestville, CA 95436
(707) 838-1630

When hobbiests think Of bog gardens, they often envision a large hole in the ground lined with sheet plastic, filled with peat, and planted with hundreds of carnivores. Large bog gardens can be a joy, but they can also be a headache, requiring lots of maintanence, water, space and plants

I prefer the mini-bog. Small containers are moveable, manageable, affordable. And they can be a surprisingly attractive addition to a greenhouse, deck or patio, requiring much less work and watering than a large,in the-ground bog garden.

**Containers:** A mini-bog can be set up in an assortment Of non-draining containers, from large glass salad bowls (see photo) to plastic bus-boy dish pans. But if watering is a hassle, think ahead. These containers will hold only a limited amount of water, and in hot, dry conditions may require watering practically every day. That's fine if you're confined to your house or have a dependable person around to water your plants while you're away. But a two week vacation can put an end to your garden if you don't have that dependable person and we all know how well non-enthusiasts are at maintaining our precious plants!

An easy solution is a sort of "island bog". These days a wide assortment of plastic garden containers are avalable on the market. Nurseries and garden centers offer many types of circular and rectangular plastic containers in a wide assortment of colors and sizes, such as the imitation terra-cotta plastic bowls that vaguely look like clay.

Look for the plastic containers with removable drainage-plug holes in the bottom. In fact, look for <u>two</u> containers, one smaller and the other larger. The smaller will hold the actual mini-bog. The larger will be the water bowl. A 14" bowl will sit rather comfortable into a 20" bowl, allowing for a considerable amount of water to entirely encircle your mini-bog, like a "moat". An even larger water bowl will further reduce watering-stress.

There are three benefits to this system. The first of course is a plentiful water supply. The second is that the water moat will prevent slugs, snails and earwigs from attacking your plants. The third is that you can grow aquatic bladderworts or waterwheel plants or tadpoles in the large moat of water.

Of course, you'll want to remove the plug in the drainage hole of the smaller container that will hold the soil and plants. Leave the plug in the larger bowl that will serve as the water reservoir.

**Soils**: It is easy to set up the mini-bog itself, whether you use the island method or not. For the island bog, place a large wad of long-fibered sphagnum moss over the unplugged hole. This will prevent your soil from escaping and turning your bog into a sinkhole.

If you want your bog garden to be lighter in weight, fill the bowl around halfway with perlite. On top of this you will add your soil. The soil for most bog gardens should be 1/2 sphagnum peat moss combined with 1/2 horticultural sand. Mix this well with plenty of purified water until it is like soft mud. Then add it to your container.

Perlite has an unsightly habit of coming to the surface of the soil when you're digging around adding your plants, so I personally like the more natural-looking peat and sand combination for the whole bog. You could use long-fibered sphagnum moss for the soil , but it sinks and decomposes more than peat and not all plants enjoy long-fibered moss, such as venus flytraps.

**Planting the Bog:** If you are going to put in bare-rooted plants, then it is best to set up your bog toward the end of winter dormancy or early spring. However, a bog can be set up anytime of the year if you use potted plants. Remove the whole lump of soil from the pot, careful not to disturb the roots in any major way. You can set these into the garden bowl that is partially filled with soil so their soil surface is fairly even with the top rim of the container. Fill in the empty space between the root balls by spooning in your soft, wet peat and sand mix. Alternatively, you simply fill the bowl with soil and then dig out holes to place your plants into, but a very wet soil will sink and collapse every time you scoop some out.

Once your plants are in, firm the soil with your fingers or a spoon. The peat may quake like a bowl of jello. Don't worry, it will eventually settle down. Your newly planted bog may look sparse and messy at first. Again. don't fret: a good selection of plants will soon fill it out.

I like to add some club mosses or pine needles to the surface of a newly planted mini-bog, to give it a natural look more quickly, and to prevent spattering from heavy rains. Some mosses will grow on their own, adding nice, stable ground-cover. I avoid adding live sphagnum, which tends to overgrow smaller plants. but if you intend to grow only larger species such as *Sarracenia* in your bog, live sphagnum can look quite nice.

Once your island mini-bog is planted, you can set it into the larger, undrained container. Then add water into this moat. Water will enter through the sphagnum plug. and the water-level in the soil will match the depth in the outer bowl. Always use purified-quality water.

Most CP like a fluctuation in their water level. Typically you can fill the moat right to the top, even with the level of soil , then let the water level drop to near the bottom over a period of days. allowing oxygen to permeate the soil. You will also be able to see how long the water lasts before the bog dries out. For those long vacations, or

if you are lazy like me, an even larger water bowl would be helpful. On the other hand, rains keep the water level too high for too long a time, such as during winter dormancy. You may want to spill out excess water during these times, to allow the roots to "breath". On average, maintain the water level about halfway deep, and never let the soil dry out.

**Selecting the Plants:.** Choosing the variety of plants you wish to grow depends on where you will keep your minibog. Greenhouses will offer the widest selection if

Figure 1. Lionel Gazeau's mini-bogs, Sonoma County

you live in a cold winter climate. But a bog of temperate plants will not do well in the winter if placed in a hot house heated above sixty degrees year'round!

For the United States, if you live in USDA Hardiness Zones 7 through 10, you can grow a nice assortment of temperate plants outdoors all year. American pitcher plants, venus flytraps, and temperate sundews such as *D. rotundifolia, intermedia, anglica* and *filiformis*, plus terrestrial bladderworts like *U. cornuta* or *subulata* do well. (Zone 7 has an average minimum winter low temperate range of 0° to 10°. Zone 8 is 10° to 20° Zone 9 20° to 30°, Zone 10 is 30° to 40°) Warmer Zones such as 9 and 10 will offer additional varieties such as cape and forked sundews, most pygmy sundews, *Cephalotus*, temperate butterworts such as *P. caerulea*. If you live say, in Chicago, Zone 5, -20° to -10° you can still grow a mini-bog outdoors year 'round, but you should obtain plants native to such northerly climes, such as *S . purpurea* ssp . *purpurea*, the sundews from areas like the Great Lakes (*rotundifolia, anglica*) and perhaps the butterwort *P. vulgaris*. These plants are often hard tofind through CP nurseries, but propagated plants can be found by advertising in this Newsletter, or grown from seed found through the seed bask.

Most people want a large variety of CP in their mini-bog, and a surprising large

amount of plants can fit in a small space. I live on the border of Zones 9 and 10, and the first bog of this type I did was in a 14" bowl. I planted *S. rubra* ssp. *wherryi* and a *S. flava* in the center. Around the edge I added *S. psittacina, D. capensis, capillaris, filiformis* v. *tracyi,* and the pygmy *D.nitidula* x *occidentalis*. I also added a couple of flytraps and *U. livida* for some color. To make it more natural, I also put in a small clump Of decorative bunch grass, and two pieces of granite rock. Other bog plants, orchids like the *Disas* which grow in South Africa with cape sundews, can look nice in the bog, and incredible when in flower. Don't add limestone rocks or sea shells, which are too limey for an acid bog.

Now,six years later, the bog still sits on my deck. All the plants have done well, except the flytraps (which don't like the often waterlogged conditions as much as the other plants). The *S.rubra* has about 50 pitchers on it, the *D.filiformis* has grown to a clump of 5, the pygmies and *D.capillaris* have even survived the onslaught of capes and grass. You can't even see the granite rocks anymore! This winter I plan to dissasemble


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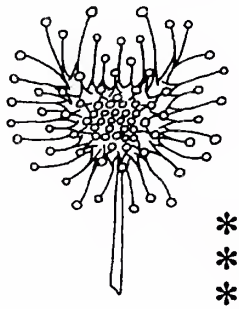

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## Special Notice

A new book with the title" Pitcher-plants of Borneo" (ISBN 983-812-009-X) by Anthea Phillipps and Antony Lamb with watercolor paintings by Susan Phillipps is published by Natural History Publications (Borneo), P.O. Box 13908, 88846 Kota Kinabalu, Sabah, Malaysia. Tel: 6088233098 Fax: 60-88-240768. This 171 page book with 30 *Nepenthes* species from the island of Borneo is RM 95.00 per copy. That is about $37.25 in USA currency inclusive of postage worldwide and may be paid for with Visa/ Mastercharge. Many of you will remember the authors from the great article on *Nepenthes* in the magazine Nature Malaysiana published in 1988.

# A dichotomous key to the genus *Drosera* L. (Droseraceae)

by
Dr. Jan Schlauer, Zwischenstr. 11, D-60594 Frankfurt/Main, Germany
email: jan@pbc-ths1.pci.chemie.uni-tuebingen.de

## Introduction

Since the world-wide monograph of the genus ***Drosera*** by Diels, (1906), many new species were described, and several treatments for local floras appeared. In order to be able to identify even wrongly labelled (or unlabelled) specimens in herbaria as well as in horticultural collections, and to provide field workers with a guidance, a dichotomous key was compiled from the data available by herbarium and literature study. As far as possible, all taxa described validly (and considered distinguishable) until present were included. The key is thought to reflect phylogenetic development to a certain degree, inasmuch as the taxa are probably of monophyletic origin (with the exception of ***sects.Oosperma*** and ***Drosera***, which may be more closely related to each other than is evident in the key). The key does rely on morphological characters even if in some cases the taxa share additional (phytochemical or cytological) features, which cannot be examined in dried herbarium specimens.

The infrageneric rearrangement by Seine & Barthlott (1994) provides little new insight, and it suffers considerably from the omission of recent information, e.g. Kondo & Lavarack's important cytological work (1984) is ignored. The key by Marchant (1982) is misleading in important distinguishing features (e.g. stipules are not "usually absent or inconspicuous" in ***subgen.Drosera***, not even in his version of this subgenus, and not even in the Australian representatives!). Substantial work has been performed on palynology (Takahashi & Sohma, 1982), and phytochemistry (Zenk, Fürbringer & Steglich, 1969; Culham & Gornall, 1994). A reference list of synonyms (at the rank of species or below) for the genus ***Drosera*** was already published in an earlier paper (Schlauer, 1987). A permanently updated version thereof is accessible via internet (http://www.hpl.hp.com/bot/cp_home; the Carnivorous Plant Homepage, maintained by Rick Walker).

The realignments and the key to this second largest genus of carnivorous plants (about 135 species recognized here, compared with 215 in ***Utricularia***, Lentibulariaceae) are not meant to represent a final conclusion. These should rather be understood as a help and a starting point for the many enthusiasts as well as the quite numerous scientists interested in this fascinating group. Even if some of the new combinations proposed here are rather preliminary, it is prefered to give all taxa used in the key valid names (however, due to lack of suitable type material, this is impossible in one case discussed below). I am well aware of several remaining shortcomings and numerous unresolved problems but I hope this modest contribution may incite efforts to overcome these.

## Infrageneric realignment of the genus ***Drosera*** L.

The infrageneric subdivision of the genus as presented in the key necessitates formal validation of some taxa. To this purpose, a nomenclatural conspectus of the taxa of ***Drosera*** above the rank of species, including the most important synonyms, is presented below. In this, some abbreviations are used:

| | |
|---|---|
| T | Type |
| LT | Lectotype |
| S | Synonym(s) |
| BN | Basionym |

***Drosera*** L., Spec.Pl.ed.1:281 (1753)
T: ***D.rotundifolia*** L.
S: *Rossolis* (Tournef. ex) Adans., Fam.2:245 (1763) *nom.superfl.*
T: *R.rotundifolia* (L.) Adans. *nom.illeg.* = ***D.rotundifolia*** L.
*Rorella* (Hall.ex) Allioni, Fl.Pedem.2:88 (1785) *nom.superfl.*
T: *R.rotundifolia* (L.) Allioni *nom.illeg.* = ***D.rotundifolia*** L.
*Esera* Neck., Elem.Bot.2:160 (1791)
T: *E.cistiflora* (L.) Neck. = ***D.cistiflora*** L.
*Adenopa* Raf., Fl.Tellur.3:37 (1836)
T: *A.anglica* (Huds.) Raf. = ***D.anglica*** Huds.
*Dismophyla* Raf., l.c.:36
T: *Dismophyla binata* (Labill.) Raf. = ***Drosera binata*** Labill.
*Filicirna* Raf., l.c.:37
T: *F.filiformis* (Raf.) Raf. = ***D.filiformis*** Raf.
*Sondera* Lehm., Pugill.8:44 (1844)
T: *S.macrantha* Lehm. = ***D.heterophylla*** Lindl.

***D.subgen.Thelocalyx*** (Planch.) Drude in Engl. & Prantl, Nat.Pflanzenfam.3:271 (1891)
BN: *D.sect.Thelocalyx* Planch., Ann.sci.nat.3.ser.9:92 (1848)
T: ***D.burmannii*** Vahl
S: *D.sect.Rorella* DC., Prodr.1:317 (1824) *p.p.*
The pentamerous gynoecium, known only in one other subgenus (viz. ***Bryastrum***), is a sufficient reason to keep this distinct from the rest of the genus. The two species belonging here, one from tropical Asia and N Australia, the other from S America share so many (assumedly primitive) features that a phylogenetic position close to the origins of the genus may be supposed.

***D.subgen.Arcturia*** (Planch.) Schlauer *stat. nov.*
BN: *D.sect.Arcturia* Planch., Ann.sci.nat.3.ser.9:91 (1848)
T: ***D.arcturi*** Hook.
S: *D.sect.Rorella* DC., Prodr.1:317 (1824) *p.p.*
*D.sect.Drosera* auct. non L.: Seine & Barthlott, Taxon 43:584 (1994) *p.p.*
*D.sect.Psychophila* auct. non Planch.: Diels, Pflanzenr.26:62 (1906) *p.p.*
The separation of this subgenus, native from SE Australia to New Zealand, from the rest of the genus is claimed here on the basis of exstipulate, sheating leaf bases. As pollen seems to be different between the two species (Culham, Am.J.Bot.80 Suppl.6:142, 1993), the leaf characteristics may be of convergent nature to a certain degree, however. Contrary to Diels (1906), inclusion of ***D.uniflora*** here is not supported (cf. ***D.subgen.D.sect.Ptycnostigma***).

***D.subgen.Stelogyne*** (Diels) Schlauer *stat.nov.*
BN: *D.sect.Stelogyne* Diels, Pflanzenr.26:103 (1906)
T: ***D.hamiltonii*** C.R.P.Andrews
S: *D.sect.Drosera* auct. non L.: Seine & Barthlott, *l.c. p.p.*
The fusion of the styles in this monotypic Australian subgenus is such a unique feature that segregation at more than sectional level seems inevitable.

***D.subgen.Meristocaulis*** (Maguire & Wurdack) Schlauer *stat.nov.*
BN: *D.sect.Meristocaulis* Maguire & Wurdack, Mem.NY Bot.Gard.9:332 (1957)
T: ***D.meristocaulis*** Maguire & Wurdack
A single species with numerous distinguishing features, the most imortant of which

being undivided styles. Apparently a rather ancient relict on the Neblina peak.

***D.subgen.Regiae*** Seine & Barthlott, *l.c.*:586

T: ***D.regia*** Stephens

S: *D.sect.Psychophila* auct.non Planch: Stephens, Trans.Roy.Soc.S.Af.13:309 (1926) *p.p.*

*D.sect.secundistyla* Culham, Novon (in press)

*D.ser.Eurossolis* Diels in Engler & Prantl, Nat.Pflanzenfam.2.ed.17b:781 (1936) *p.p.*

Sufficient palynological reasons for subgeneric separation of this primitive S African species have been presented by Takahashi & Sohma (1982), already.

***D.subgen.Coelophylla*** (Planch.) Schlauer *stat. nov.*

BN: *D.sect.Coelophylla* Planch., Ann.sci.nat.3.ser.9:93 (1848)

T: ***D.glanduligera*** Lehm.

The obviously primitive pollen type does not allow inclusion of this Australian species in ***subgen.Drosera.***

***D.subgen.Lasiocephala*** (Planch.) Schlauer *stat. nov.*

BN: *D.sect.Lasiocephala* Planch, Ann.sci.nat.3.ser.9:93 (1848)

T: ***D.petiolaris*** R.Br.

S: *D.sect.Rorella* DC., *l.c.*:317 *p.p.*

*D.sect.Ergaleium* DC., *l.c.*:319 *p.p.*

*D.sect.Rossolis* auct. non Planch.: Diels, (1906):62 *p.p.*

*D.sect.Polypeltes* Diels, (1906):62 *p.p.*

The most outstanding feature of this subgenus (native to tropical N Australia and New Guinea) is the subpeltate to peltate lamina, not known in any species of ***subgen.Drosera*** proper. The completely peltate lamina alone was sufficient for both Diels (1906) and Marchant (1982) to shift ***D.banksii*** (which was included here by Planchon, 1848) to ***subgen.Ergaleium***. Kondo & Lavarack (1982) have shown by cytological similarity that this species is closest to the ***D.petiolaris*** complex. Morphological features (presence of stipules and absence of tuber) have led Seine & Barthlott (1994) to the same conclusion. Another important argument is style morphology.

Of all subgenera segregated here, this is the closest to ***subgen.Drosera***, but in the present situation a separation seems favourable.

As the lamina margin of ***D.neocaledonica*** (endemic to New Caledonia) is continuous with the petiole margin, this species (formerly included here because of dubious stipule and indumentum features by Diels, 1906) should be shifted to ***subgen.Drosera*** (***sect.Oosperma***).

***D.subgen.Drosera***

S: *D.sect.Rorella* DC., *l.c. p.p. nom. superfl.* (cf. ***D.subgen.Bryastrum***)

S: *D.subgen.Rorella* (DC.) Diels, (1906):92 *nom. superfl.*

(cf. ***D.subgen.Bryastrum***)

***D.subgen.D.sect.Prolifera*** C.White, Vict.Nat.57:94 (1940)

T: ***D.prolifera*** C.White

S: *D.sect.Drosera* auct. non L.: Seine & Barthlott, *l.c.*:584 *p.p.*

*D.sect.Arachnopus* auct. non Planch.: Diels, (1906):77 *p.p.*

This section includes not only ***D.prolifera*** but also ***D.schizandra*** and ***D.adelae***. These three tropical N Australian species are considered more closely related to each other than is any of them to ***D.indica***, which should be excluded from this section, therefore.

***D.subgen.D.sect.Arachnopus*** Planch., *l.c.*:92

T: ***D.indica*** L.

S: *D.subgen.Arachnopus* (Planch.) Drude, *l.c.*:272

*D.sect.Rorella* DC., l.c. :319 p.p.
*D.sect.Drosera* auct.non L.: Seine & Barthlott, *l.c. p.p.*
A single paleotropic species.

***D.subgen.D.sect.Ptycnostigma*** Planch.
BN: *D.sect.Ptycnostigma* Planch., Ann.sci.nat.3.ser.9:92 (1848)
LT: ***D.pauciflora*** Banks ex DC. (Seine & Barthlott, *l.c.*:585)
S: *D.sect.Rorella* DC., *l.c.* :317 *p.p.*
*D.sect.Rossolis* Planch., *l.c.*:92 *p.p.*
*D.sect.Drosera* auct. non L.: Seine & Barthlott, *l.c. p.p.*
*D.sect.Psychophila* Planch., *l.c.*:91
T: ***D.uniflora*** Willd.
*D.subgen.Ptycnostigma* (Planch.) Diels, (1906):62
BN: *D.sect.Ptycnostigma* Planch.

With the distinguishing features as considered significant here (reduced stipules, but rudiments often visible, frequently thickened roots as storage organs, a tendency to form rather large corollas with wide corolla lobes), the circumscription of this section is widened considerably. It now includes all species of ***subgen.Drosera*** with the stipules adnate to the petiole. A noteworthy rearrangement is the inclusion of the two American species ***D.brevifolia*** (formerly included in ***sect.Drosera***) and especially ***D.uniflora*** (formerly grouped with or near what is considered another subgenus in this treatment, viz. ***Arcturia***). The last mentioned species shows close morphological (incl. palynological) affinities with ***subgen.Drosera***, however, and it is felt that its placement here does more accurately reflect phylogenetic relationship.

***D.subgen.D.sect.Oosperma*** Schlauer *sect.nov.*

Folia stipulis conspicuis obsita. Styli 3, basi bifurcati, deinde integri, stigma integrum vel nonnunquam bilobum, rarissime iterum divisum. Semina ellipsoidea ad ovoidea.

T: ***D.intermedia*** Hayne
S: *D.sect.Rorella* DC., *l.c.* :318 *p.p.*
*D.sect.Rossolis* Planch., *l.c.*:92 *p.p.*
*D.ser.Eurossolis* Diels, (1906):81 *p.p.*

This section is a possibly fairly inhomogeneous grouping of all species formerly included in ***sect.Drosera***, but differing from ***D.rotundifolia*** and its allies by the seeds being ovoid rather than fusiform. Further research is necessary to elucidate the natural affinities of this section. In its present circumscription, this section is nearly as widespread as ***sect.Drosera***.

***D.subgen.D.sect.Drosera***
S: *D.sect.Rorella* DC., *l.c.* :317 *nom. superfl.* (cf. ***D.subgen.Bryastrum***)
*D.sect.Rossolis* Planch., *l.c. nom.superfl.*
T: ***D.rotundifolia*** L.
*D.ser.Eurossolis* Diels (1906):81 *nom.superfl.*
T: ***D.rotundifolia*** L.
*D.sect.Cripterisma* Planch., *l.c.*
T: ***D.hilaris*** Cham. & Schlechtd.
*D.sect.Vagae* Drude, *l.c.*:271
T: ***D.capensis*** L.

A rather homogeneous grouping, and the only one which has reached a wide distribution on all continents with the exception of Antarctica (however with only few species in the northern hemisphere). Considerable range extensions at least of the

(nearly) circumboreal species must have occurred in rather recent evolutionary times. Some of the youngest species of the genus have to be sought here. The group itself is not necessarily an advanced one, however.

***D.subgen.Bryastrum*** (Planch.). Schlauer *stat. nov.*
BN: *D.sect.Bryastrum* Planch., Ann.sci.nat.3.ser.9:94 (1848)
T: ***D.pygmaea*** DC.
S: *D.sect.Rorella* DC., *l.c. p.p.*
*D.subgen.Rorella* (DC.) Diels, (1906):81 *p.p.*
*D.subgen.Rorella* auct. non (DC.) Diels: N.Marchant, Fl.Au. 8:10 (1982) *nom.illeg.*

At generic level, *Rorella* (Hall.ex) Allioni is a superfluous name for ***Drosera***, originally containing only *R.longifolia* (= ***D.anglica***) and *R.rotundifolia* (= ***D.rotundifolia***). As defined by De Candolle, *sect.Rorella* was not assigned a type species, but he evidently considered this to be the typical section (including ***D.rotundifolia***). Even when elevated to *D.subgen.Rorella* by Diels, it contained ***D.rotundifolia*** (in a separate *sect.Rossolis*, which is a superfluous name for ***sect.Drosera***). Thus, *sect.Rorella* DC., and *subgen.Rorella* (DC.) Diels are superfluous names for ***sect.Drosera*** and ***subgen.Drosera***, respectively.

Selecting a name for a new subgenus including ***D.pygmaea*** as the type species and excluding ***D.rotundifolia***, N.Marchant chose the name *Rorella*, which included ***D.rotundifolia*** in all of its circumscriptions (v.s.). Violating the original intention of Diels (*Rorella* should include ***D.rotundifolia***), this is considered illegitimate. For these reasons, it is proposed here to elevate the rank of Planchon's *sect.Bryastrum*, and thus to retain the type of N.Marchant's *subgen.Rorella*, but replace it with a legitimate name.

When elevated to subgenus (because of style morphology and the unique formation of asexual propagules called gemmae), this purely SW Australian (***sect.Lamprolepis***) or SE Australian to New Zealandic group (***sect.Bryastrum***, monotypic) group includes two subsets, separated from each other geographically as well as morphologically.

Even if the value of sectional distinction has been doubted in recent times (cf. Cheek, 1990), it is considered necessary in the context of the present grouping (especially compared with the other sections recognized here).

***D.subgen.Bryastrum sect.Bryastrum*** Planch., *l.c.*:94
S: *D.sect.Rorella* DC., *l.c. p.p.*
*D.sect.Rorella* auct. non DC.: N.Marchant, *l.c.*

***D.subgen.Bryastrum sect.Lamprolepis*** Planch., *l.c.*:93
T: ***D.platystigma*** Lehm.
S: *D.sect.Rorella* DC., *l.c. p.p.*
*D.sect.Bryastrum* auct. non Planch.: Seine & Barthlott, *l.c.*:585 *p.p.*

***D.subgen.Phycopsis*** (Planch.) Schlauer, *stat. nov.*
BN: *D.sect.Phycopsis* Planch., Ann.sci.nat.3.ser.9:93 (1848)
T: ***D.binata*** Labill.
S: *D.sect.Ergaleium* DC., *l.c.* :319 *p.p.*

A monotypic subgenus (from E Australia to New Zealand) intermediate between the previous subgenera and those below, but closer to the last (by phytochemistry, style morphology). It is unique at first glance (forked lamina!), and it cannot be united with any of these.

***D.subgen.Ergaleium*** (DC.) Drude, *l.c.* :271
BN: *D.sect.Ergaleium* DC., Prodr.1:319 (1824)
T: *D.menziesii* R.Br. ex DC.

The most natural grouping of all recognized here, sharing (apparently with one notable exception) corm formation and basally multipartite style branches, and almost

endemic to Australia, only two species reaching New Zealand (***D.peltata ssp.auriculata***) tropical Asia (***D.p.ssp.peltata***) and even E Africa (***D.insolita***, almost certainly a recent-synanthropous?-range extension). The systematic tripartition by DeBuhr (1977) has not been doubted since.

***D.subgen.Ergaleium sect.Ergaleium***

S: *D.sect.Polypeltes* Diels, (1906):62 *p.p. nom.superfl.*
T: ***D.menziesii*** R.Br. ex DC.
*D.ser.Scutelliferae* Planch., *l.c.*:95 *nom.superfl.*
T: ***D.menziesii*** R.Br. ex DC.
*D.ser.Luniferae* Planch., *l.c.*
T: ***D.peltata*** Thunb.

***D.subgen.Ergaleium sect.Stolonifera*** (Planch.) DeBuhr, Austral.J.Bot.25:215 (1977)
BN: *D.subser.stoloniferae* Planch., Ann.sci.nat.3.ser.9:95 (1848)
T: ***D.stolonifera*** Endl.

***D.subgen.Ergaleium sect.Erythrorhiza*** (Planch.) Diels, (1906):62
BN: *D.ser.erythrorhizae* Planch., Ann.sci.nat.3.ser.9:95 (1848)
T: ***D.erythrorhiza*** Lindley
S: *D.ser.rosulatae* Lehm., Pugill.8:36 (1844)
T: ***D.rosulata*** Lehm.
*D.subser.rosulatae* (Lehm.)Planch., *l.c.*
BN: *D.ser.rosulatae* Lehm.

New combinations in ***Drosera*** L.

In dealing with the whole genus on a world wide basis, the circumscriptions of ranks should preferably be comparable to each other. Theoretical as well as practical reasons necessitate alterations of rank in several taxa. For infraspecific subdivision as proposed here, subspecies are allopatric, whereas varieties are sympatric. The rank of form does not seem applicable in a genus as variable as ***Drosera***.

***D.barbigera subsp.silvicola*** (Lowrie & Carlquist) Schlauer *comb. & stat. nov.*
BN: *D.silvicola* Lowrie & Carlquist, Phytologia 73:105 (1992)
T: 7 km S N Bannister on the Albany Hwy., W.A., 11. 11. 1991, A.Lowrie 513 (PERTH)

***D.citrina var.nivea*** (Lowrie & Carlquist) Schlauer *comb. & stat.nov.*
BN: *D.nivea* Lowrie & Carlquist, Phytologia 73:104 (1992)
T: beside Midlands Rd., 37.3 km SE Carnamah, ca. 10 km SE of Coorow, W. A., 22. 9. 1990, A.Lowrie 278 (PERTH)

***D.dichrosepala subsp.enodes*** (N.Marchant & Lowrie) Schlauer *comb. & stat.nov.*
BN: *D.enodes* N.Marchant & Lowrie, Kew Bull.47:323 (1992)
T: NE Augusta, junction of Courtney Road and Scott River Road, W.A., 9. 11. 1983, A.Lowrie 83/049 (PERTH)

***D.parvula subsp.sargentii*** (Lowrie & N.Marchant) Schlauer *comb. & stat. nov.*
BN: *D.sargentii* Lowrie & N.Marchant, Nuytsia 8:330 (1992)
T: Junction of Stockyard Road & Merivale Road, SE corner, c. 20 km E Esperance, W.A., 22. 11. 1989, A.Lowrie s.n. (PERTH)

***D.paleacea subsp.stelliflora*** (Lowrie & Carlquist) Schlauer *comb. & stat. nov.*
BN: *D.stelliflora* Lowrie & Carlquist, Phytologia 73:107 (1992)

T: at motocross track, E end of N Jindong Rd., S Busselton, W.A., 24. 11. 1990, A.Lowrie 204 (PERTH)

***D.paleacea subsp.leioblastus*** (N.Marchant & Lowrie) Schlauer *comb. & stat.nov.*
BN: *D.leioblastus* N.Marchant & Lowrie, Kew Bull.47:325 (1992)
T: Brand Highway, 14.3 km NW Cataby, W.A., 29. 9. 1985, A.Lowrie 85/084 (PERTH)

***D.paleacea subsp.roseana*** (N.Marchant & Lowrie) Schlauer *comb. & stat.nov.*
BN: *D.roseana* N.Marchant & Lowrie, Kew Bull.47:327 (1992)
T: Millbrook Road, 5 km E Albany Highway, W.A., 7. 10. 1987, A.Lowrie 87/025 (PERTH)

***D.occidentalis var.microscapa*** (Debbert) Schlauer *comb. & stat.nov.*
BN: *D.microscapa* Debbert, Mitt.Bot.Staatss.Muenchen 30:377 (1991)
T: S coast of W.A., P.Debbert 94 (M)

***D.nitidula var.allantostigma*** (N.Marchant & Lowrie) Schlauer *stat. nov.*
BN: *D.nitidula subsp.allantostigma* N.Marchant & Lowrie, Kew Bull.47:325 (1992)
T: Brand Highway, 1.3 km N Hill River, W.A., 7. 11. 1987, A.Lowrie 87/056 (PERTH)

***D.nitidula var.leucostigma*** N.Marchant & Lowrie) Schlauer *stat. nov.*
BN: *D.nitidula subsp.leucostigma* N.Marchant & Lowrie, Kew Bull.47:325 (1992)
T: Brand Highway, 14.3 km NW Cataby, W.A., 7. 11. 1987, A.Lowrie 87/058 (PERTH)

***D.gigantea var.geniculata*** (N.Marchant & Lowrie) Schlauer *stat. nov.*
BN: *D.gigantea subsp.geniculata* N.Marchant & Lowrie, Kew Bull.47:316 (1992)
T: 2 km N Brennans Ford on Scott River Road, W.A., 16. 9. 1984, A.Lowrie s.n. (PERTH)

***D.stricticaulis subsp.eremaea*** (N.Marchant & Lowrie) Schlauer *comb.nov.*
BN: *D.macrantha subsp.eremaea* N.Marchant & Lowrie, Kew Bull.47:318 (1992)
T: 30 km S Mt. Magnet, W.A., 1. 7. 1984, A.Lowrie 84/072 (PERTH)

One apparently new variety of ***D.nitidula*** (confused with ***D.n.subsp.omissa*** by A.Lowrie in Carniv. Pl. of Australia 2,1989) cannot be given a valid name at present because no specimen was cited. This is symbolized by "var.?" in the key.

The "collective species" ***D.capillaris***, ***D.montana*** and ***D.leucoblasta*** need a reinvestigation. As long as this is not performed, it is assumed best to maintain the names and ranks which were used as the "microspecies" were first described (with some exceptions in ***D.montana***). Also, a thorough examination of the widespread and polymorphic species ***D.spatulata*** may allow infraspecific subdivision in the future.

A perhaps unusual type of numbering is presented with this key. The position of a digit in a number reflects the position of a corresponding character pair in the key. The value of a digit reflects the character state. Thus, the opposite of

"001100. Lamina lanceolate, 4-7 mm long"

is

"001101. Lamina ovoid or circular, up to 3 mm long"

and vice versa. This kind of numbering has the advantage of facilitating direct comparison and identification of the difference between any two given taxa by just comparing their appropriate numbers, e.g.:

"1011011. (...)
***D.macrantha*** Endl."

and

(***D.stricticaulis***...)
"1010101. (...)
***subsp.eremaea*** (N.Marchant & Lowrie) *comb.nov.*"

The most significant different digit (in this case at 4. position) indicates the specific difference between the two, i.e.:

"1011. Styles divided to base but not apically"

vs.

"1010. Styles divided to base and apically plurifid"

Key to the genus ***Drosera*** L.

0. Plants without corms, stipules present or styles basally bipartite or entire, leaves never peltate
00. Lamina entire, never dichotomously branched, styles entire or dichotomously branched and not basally multipartite
000. Styles connate or divided or at least stigmatic apex flabellately multifid or dichotomously branched, no asexual propagules (gemmae) formed
0000. Gynoeceum 5-merous
***Subgen.Thelocalyx*** (Planchon) *stat.nov.*
00000. Leaves obovate, longer than 12 mm, stigmata dichotomously divided
***D.sessilifolia*** St.Hil.
00001. Leaves cuneate, shorter than 12 mm, stigmata flabellately multifid
***D.burmannii*** Vahl
0001. Gynoeceum 3-merous
00010. Leaves exstipulate, leaf base sheating, flowers single, rarely 2- 3, pedicels glabrous, petals not upturning and uniting after anthesis
***Subgen.Arcturia*** (Planch.) *stat. nov.*
000100. Leaves linear, lamina continuous with petiole, sepals oblong, not much shorter than petals
***D.arcturi*** Hook.
000101. Lamina spathulate, sepals scarcely longer than wide, much shorter than petals
***D.stenopetala*** Hook.f.
00011. Leaves not sheating, petals upturning and uniting after anthesis

000110. Styles connate for at least 1/2 of their length
***Subgen.Stelogyne*** (Diels) *stat.nov.*
***D.hamiltonii*** C.R.P.Andrews
000111. Styles not connate, divergent from base
0001110. Styles not divided below stigmatic area
00011100. Flowers single, stem branched, stipules present, leaves petiolate, lamina oblanceolate and up to 5 cm long
***Subgen.Meristocaulis*** (Maguire & Wurdack) *stat. nov.*
***D.meristocaulis*** Maguire & Wurdack
00011101. Flowers mostly not single, stem not branched, stipules absent, petioles indistinct, lamina linear, usu. longer than 20 cm
***Subgen.Regiae*** Seine & Barthlott
***D.regia*** Stephens
0001111. Styles divided below stigmatic area
00011110. Floral bracts absent, inflorescence many-flowered, styles repeatedly dichotomously divided
000111100. Scapes glandular, lamina not subpeltate-peltate
***Subgen.Coelophylla*** (Planch.) *stat. nov.*
***D.glanduligera*** Lehm.
000111101. Scapes eglandular pubescent, lamina subpeltate-peltate
***Subgen.Lasiocephala*** (Planch.) *stat. nov.*
0001111010. Stems elongate, ascending
***D.banksii*** R.Br.
0001111011. Stems short, acaulescent
00011110110. Tomentum consisting of single or shortly branched hairs
000111101100. Petioles narrower than 5 mm
0001111011000. Stigma branched from centre, petioles broader than 1 mm in the broadest point
***D.dilatatopetiolaris*** Kondo
0001111011001. Stigma branched from base, petioles up to 1 mm wide
***D.petiolaris*** R.Br.ex DC.
000111101101. Petioles broader than 5 mm
***D.falconeri*** Tsang ex Kondo
00011110111. Tomentum of dendritic hairs, woolly
000111101110. Petiole linear with a maximum width 1-1.5 mm; lamina 2-2.5 mm long, 2.5-3 mm wide; pedicels 1.5-2.5 mm long
***D.lanata*** Kondo
000111101111. Petiole oblanceolate with a maximum width 2-4 mm; lamina 3-4 mm long, 3.5-5 mm wide; pedicels 2-4.5 mm long
***D.ordensis*** Lowrie
00011111. Floral bracts present or inflorescence single flowered
Subgen.***Drosera***
000111110. Seeds ovoid or ellipsoid, testa not produced beyond embryo
0001111100. Stipules absent, reduced to two lateral trichomes or rarely present, if stipules present leaves with short indistinct petioles and large, broad laminae and anther thecae separated by large connective and petals scarcely reaching sepals in length
00011111000. Anther thecae separated by large connective, petals scarcely reaching sepals in length
***Sect.Prolifera*** C.White
000111110000. Leaves with very short, indistinct petioles, lamina longer than wide, stipules conspicuous
0001111100000. Lamina pointed apically, broadest near the centre
***D.adelae*** F.Muell.
0001111100001. Lamina truncate to emarginate apically, broadest near apex

***D.schizandra*** Diels

000111110001. Leaves distinctly petiolate, lamina reniform, stipules reduced to lateral, gland-tipped trichomes

***D.prolifera*** C.White

00011111001. Anther thecae not separated by large connective, petals longer than sepals

000111110010. Inflorescence arising laterally from ascending stem and bearing usu. more than 6 flowers, roots not thickened as storage organs

***Sect.Arachnopus*** Planch.

***D.indica*** L.

000111110011. Inflorescence arising centrally from basal rosette or terminal on ascending stem with up to 4 flowers, roots thickened as storage organs if stems ascending

***Sect.Ptycnostigma*** Diels

0001111100110. Stipules present, adnate for their whole length with the exception of two inconspicuous lateral setae, cauline leaves absent

00011111001100. Petals shorter than 8 mm or scape absent

000111110011000. Scape conspicuous

0001111100110000. Seeds papillate

***D.brevifolia*** Pursh

0001111100110001. Seeds favose

00011111001100010. Leaves distinctly petiolate, lamina spathulate-orbicular, scape glabrous

***D.uniflora*** Willd.

00011111001100011. Leaves sessile, lamina cuneate, scape glandular-pilose

***D.trinervia*** Spreng.

000111110011001. Scape absent, flowers almost sessile

***D.acaulis*** L.f.

00011111001101. Petals longer than 10 mm, scape conspicuous

***D.pauciflora*** Banks ex DC.

0001111100111. Stipules absent, cauline leaves present

***D.cistiflora*** L. *s.l.*

00011111001110. Petals up to 20 mm long, with a dark base

***D.cistiflora*** L. *s.str.*

00011111001111. Petals up to 10 mm long, without dark base

***D.alba*** Phill.

0001111101. Stipules always present and conspicuous, if adnate then lateral stipule-segments large and divided and leaves with long and narrow laminae and petals longer than sepals

***Sect.Oosperma*** *sect.nov.*

00011111010. Seeds papillate

000111110100. Stipules adnate to petiole for their whole length, laminae more than 4 times as long as wide

000111110101010. Petioles distinct 2-5 cm long

***D.linearis*** Goldie

000111110101011. Petioles indistinct, almost absent

***D.filiformis*** Raf.

0001111101010110. Leaves up to 25 cm long, stamina up to 7 mm long, glands on leaves red

***var.filiformis***

0001111101010111. Leaves up to 50 cm long, stamina longer than 8 mm, glands on leaves green

***var.tracyi*** (Macf.) Diels

000111110101. Stipules adnate to petiole for up to 1/2 of their length, laminae not more than 3 times as long as wide

0001111101010. Seeds crateriform-papillate, scapes erect, petiole distinct

00011111010100. Scapes glabrous or inconspicuously glandular-puberulent

000111110101000. Plants forming stems covered by remains of dead leaves

***D.hirticalyx*** R.Duno & Culham

000111110101001. Plants with +/- flat rosette, not forming stems

***D.capillaris*** Poir. *s.lat.*

0001111101010010. Scapes longer than 5 cm, sepals longer than 2 mm

***D.capillaris*** Poir. *s.str.*

0001111101010011. Scapes shorter than 5 cm, sepals shorter than 2 mm

***D.tenella*** Willd. ex Roem. & Schult.

00011111010101. Scapes with conspicuous indumentum

000111110101010. Scapes glandular-pilose

***D.panamensis*** Correa & A.S.Taylor

000111110101011. Scapes eglandular pilose

***D.colombiana*** Fernandez-Perez

0001111101011. Seeds bullate to muricate-papillate, scapes ascending, plants acaulescent and petiole gradually widening into lamina, or +/- ascendidng with distinct petioles

00011111010110. Seed papillae shallow and inconspicuous (seeds almost foveolate- reticulate), scapes pubescent, mostly also glandular, petioles short, gradually broadening into lamina, plants acaulescent, scapes 1-15 cm long with usu. fewer than 10 flowers,

***D.montana*** St.Hil. *s.l.*

000111110101100. Scapes only inconspicuously ascending with narrow curve at the base

***D.montana*** St.Hil. *s.str.*

0001111101011000. Scape base glandular-pilose

***var.montana***

0001111101011001. Scape base eglandular-pilose

00011111010110010. Sepals glandular-pilose, scape apex only with +/- stalked glands or glabrous

***var.tomentosa*** (St.Hil.) Diels

00011111010110011. Sepals eglandular-pilose, scape apex eglandular-pilose

***var.schwackei*** Diels

000111110101101. Scapes more conspicuously ascending with wide curve at the base, scapes long eglandular-pilose at base and glandular + eglandular-pilose above

***D.hirtella*** St.Hil.

0001111101011010. Scapes red, strikingly ascending, with shorter red hairs in lower 2/3 or all of the scape, calyx lobes frequently with some eglandular hairs, petioles glabrous or almost so, leaves less numerous, usu. red

***var.hirtella***

0001111101011011. Scapes yellowish green, more erect, with longer, yellowish hairs in lower 1/2 of the scape, missing or very sparse in upper portion which is mainly glandular hairy, calyx lobes with only glandular hairs, petioles hairy, leaves more numerous, deeper purple red

***var.lutescens*** St.Hil

00011111010111. Seed papillae conspicuous, plants (mostly) ascending or forming stems, petiole distinct, scapes glandular puberulent or glabrous

000111110101110. Plants forming stems covered with remains of dead leaves, scapes glandular puberulent, 10-25 cm long, more than 4 times as long as leaves, with usu. more than 10 flowers

***D.roraimae*** (Klotzsch ex Diels) Maguire & Laundon

000111110101111. Plants often caulescent but not covered with remains of dead leaves, scapes glabrous, shorter and not more than twice as long as leaves, with usu. less than 10 flowers

***D.intermedia*** Hayne

00011111011. Seeds foveolate or reticulate

000111110110. Plants ascending, scape erect

0001111101100. Styles apically entire

***D.bequaertii*** Taton

0001111101101. Styles divided apically

***D.neocaledonica*** Hamet

000111110111. Plants acaulescent, leaves in basal rosettes

0001111101110. Scapes erect

00011111011100. Scapes glabrous or inconspicuously glandular puberulent

000111110111000. Sepals shorter than 3 mm

***D.esmeraldae*** (Steyerm.) Maguire & Wurdack

000111110111001. Sepals longer than 3 mm

***D.pusilla*** H.B.K.

00011111011101. Scapes with conspicuous indumentum

000111110111010. Scapes glandular-pilose, petiole gradually widened into lamina

0001111101110100. Petioles setaceous-pilose beneath, lamina narrowly oblanceolate

***D.arenicola*** Steyerm.

00011111011101000. Scapes up to 2 cm long with up to 4 flowers

***var.arenicola***

00011111011101001. Scapes longer than 2 cm with more than 4 flowers

***var.occidentalis*** Maguire & Wurdack

0001111101110101. Leaves glabrous or sparingly, i.e.not setaceous pilose beneath, lamina obovate

***D.cayennensis*** Sagot ex Diels

000111110111011. Scapes eglandular-pilose, petioles distinct, lamina rotundate- obovate to suborbicular

0001111101110110. Flowers 2-5, peduncle longer than 2 cm

***D.kaieteurensis*** Brumm.-Ding.

0001111101110111. Flowers single, rarely 2, peduncle scarcely 2.5 mm long

***D.felix*** Steyerm.& L.B.Smith

0001111101111. Scapes ascending

00011111011110. Styles thickened basally, tapering towards apex

***D.spatulata*** Labill.

00011111011111. Styles thickening towards apex

000111110111110. Scapes glabrous, stigma divided

***D.oblanceolata*** Y.Z.Ruan

000111110111111. Scapes with tomentum, stigma entire

0001111101111110. Petiole gradually widening into lamina, flowers red

***D.dielsiana*** Exell & Laundon

0001111101111111. Petiole abruptly widening into lamina, flowers white to pale pink

00011111011111110. Scapes glandular

***D.burkeana*** Planch.

00011111011111111. Scapes eglandular-pilose

***D.pilosa*** Exell & Laundon

000111111. Seeds narrowly fusiform with testa produced below and above the embryo

***Sect.Drosera***

0001111110. Plants acaulescent with basal rosette, if scape glandular then petiole indistinct

00011111100. Scapes glabrous or eglandular pubescent, lamina orbicular to linear, not cuneate, petiole glabrous or sparsely pilose beneath

000111111000. Lamina linear, longer than 1.5 cm

***D.anglica*** Huds.

000111111001. Lamina oblong to orbicular, up to 1 cm long

0001111110010. Lamina oblong, stipules divided to base

***D.communis*** St.Hil.

0001111110011. Lamina orbicular, stipules divided above centre

***D.rotundifolia*** L.

00011111101. Scapes glandular-pilose, petiole indistinct or strigose-

pilose beneath
000111111010. Styles not repeatedly forked, stigma swollen
0001111110100. Petiole indistinct, not strigose-pilose beneath, lamina cuneate
***D.cuneifolia*** L.f.
0001111110101. Petiole distinct
00011111101010. Lamina orbicular-spathulate
***D.slackii*** M.R.Cheek
00011111101011. Lamina linear, about 8 times as long as wide
***D.cendeensis*** Tamayo & Croizat
000111111011. Styles repeatedly forked, stigma not much swollen
0001111110110. Leaves obovate, rounded at apex, thin, flowers light red to white, rosette with 1 layer of green leaves
***D.natalensis*** Diels
0001111110111. Leaves cuneate, +/- triangular, coriaceous, flowers darker red, rosette with several layers of functional leaves
***D.aliciae*** Hamet
0001111111. Plants caulescent, stems at least 2 cm long, if acaulescent then petiole distinct
00011111110. Lamina scarcely 3 times as long as wide
000111111100. Stems very long (usu. 60-90 cm)
***D.elongata*** Exell & Laundon
000111111101. Stems shorter (up to 30 cm)
0001111111010. Leaves evenly spaced on the stem
***D.katangensis*** Taton
0001111111011. Leaves crowded apically on the stem
00011111110110. Petioles +/- densely pilose, especially on the lower surface, leaves reflexed in age
000111111101100. Scapes +/- erect, stipules deeply dissected
***D.glabripes*** (Harv.) Stein
000111111101101. Scapes conspicuously curved basally, stipules lacerated apically
***D.madagascariensis*** DC.
00011111110111. Petioles sparsely pubescent on both surfaces, leaves erect in age
***D.affinis*** Welw.ex Oliv.
00011111111. Lamina at least 4 times as long as wide
000111111110. Stipules divided to base, inconspicuous in the dense tomentum of the stem
***D.hilaris*** Cham.& Schlechtd.
000111111111. Stipules entire at least to centre
0001111111110. Leaf lamina glabrous or pilose, not woolly beneath
00011111111100. Scapes glabrescent
***D.humbertii*** Exell & Laundon
00011111111101. Scapes glandular pilose
000111111111010. Stipules divided into subulate setaceous appendages apically, petioles with rust-brown hairs
***D.ramentacea*** Burch. ex DC.
000111111111011. Stipules slightly cleft apically, nearly entire, petioles glabrescent, not with rust-brown indumentum
***D.capensis*** L.
0001111111111. Lamina with wooly indumentum beneath
00011111111110. Lamina oblong spathulate, up to 2 cm long
***D.chrysolepis*** Taub.
00011111111111. Lamina linear, at least 3 cm long
000111111111110. Lamina scarcely 8 cm long, scapes glabrous
***D.villosa*** St.Hil.
000111111111111. Lamina longer than 10 cm, scapes villous

***D.graminifolia*** St.Hil.

001. Styles never divided, stigmatic apex sometimes broadened or flabellate, asexual propagules (gemmae) usually formed

***Subgen.Bryastrum*** (Planch.) *stat. nov.*

0010. Flowers 4-merous

***Sect.Bryastrum***

***D.pygmaea*** DC.

0011. Flowers 5-merous

***Sect.Lamprolepis*** Planch.

00110. Stigma confluent with style, not widest near apex, lamina shallow

001100. Lamina lanceolate, 4-7 mm long

0011000. Calyx red-hirsute, corolla orange, leaf lamina 6-7 mm long

***D.barbigera*** Planch.

00110000. Scapes covered with long, lanate, glandular hairs, corolla red or bright orange, black in throat, styles and stigmas black

***subsp.barbigera***

00110001. Scapes with short, studlike glandular hairs, corolla pink, red in throat, styles red, stigmas white

***subsp.silvicola*** (Lowrie & Carlquist) *comb. & stat. nov*

0011001. Calyx transparent-hirsute, corolla white or pink, leaf lamina 2.5-6 mm long

***D.scorpioides*** Planch.

001101. Lamina ovoid or circular, up to 3 mm long

0011010. Petals emarginate, 3 mm long

***D.eneabba*** N.Marchant & Lowrie

0011011. Petals ovate or longer than 3 mm

00110110. Styles 5, filiform and horizontal, stipule-cluster angled and acute or petioles flattened and 2-2.5 mm wide

001101100. Stipule-cluster angled, acute, petioles narrower than 1 mm

***D.androsacea*** Diels

001101101. Stipule-cluster ovoid, petioles flattened, 2-2.5 mm wide

***D.pulchella*** Lehm.

00110111. Styles 3-4, very rarely 5, stipule-cluster not angled, petioles up to 1 mm wide

001101110. Stipule-cluster compact and hemispherical

***D.pycnoblasta*** Diels

001101111. Stipule-clusters tipped, not compact and hemispherical

0011011110. Petals white, mostly yellow in outer half, petiole minutely glandular on upper surface only, style+stigma filiform, not thickened

***D.citrina*** Lowrie & Carlquist

00110111100. Flowers with petals yellow in outer half

***var.citrina***

00110111101. Flowers white

***var.nivea*** (Lowrie & Carlquist) *comb. & stat.nov.*

0011011111. Flowers white, pink or orange, never yellow, petiole glandular beneath, marginally, on both surfaces, or glabrous, style+stigma slightly thickened

00110111110. Scapes 4.5-12 cm long, sepals not reflexed in flower, petals (5- ) 7-10 mm long, orange, white, or pink

***D.leucoblasta*** Benth. *s.l.*

001101111100. Fruiting pedicels all erect

0011011111000. Style+stigma tapering from base

00110111110000. Flowers orange

***D.echinoblastus*** N.Marchant & Lowrie

00110111110001. Flowers white or pink

***D.helodes*** N.Marchant & Lowrie

0011011111001. Style+stigma widest near centre

00110111110010. Stipule-cluster 4 mm long, stipules multipartite
001101111100100. Flowers orange
***D.callistos*** N.Marchant & Lowrie
001101111100101. Flowers white or pink
***D.closterostigma*** N.Marchant & Lowrie
00110111110011. Stipule-cluster 7 mm long, compact and smooth
***D.leucoblasta*** Benth. s.str.
001101111101. Fruiting pedicels reflexed
0011011111010. Petals pandurate
00110111110100. Flowers orange
***D.miniata*** Diels
00110111110101. Flowers white or pink
***D.walyunga*** N.Marchant & Lowrie
0011011111011. Petals obovate
***D.spilos*** N.Marchant & Lowrie
00110111111. Scapes up to 5 cm long or sepals reflexed in flower, petals never orange
001101111110. Petals up to 6.5 mm long, dark pink
***D.lasiantha*** Lowrie & Carlquist
001101111111. Petals shorter than 6 mm, white, sometimes with pink spots
0011011111110. Flowers usu. fewer than 15, well-spaced
00110111111100. Sepals reflexed in flower
***D.dichrosepala*** Turcz.
001101111111000. Peduncle, pedicels, and base of sepals minutely glandular puberulent
***subsp.dichrosepala***
001101111111001. Peduncle, pedicels, and sepals glabrous
***subsp.enodes*** (N.Marchant & Lowrie) *comb. & stat.nov.*
00110111111101. Sepals not reflexed in flower
001101111111010. Petals narrowly obovate, without pink spots
0011011111110100. Petiole widest near center, sepals elliptic
***D.oreopodion*** N.Marchant & Lowrie
0011011111110101. Petiole widest near base, sepals orbicular
***D.grievei*** Lowrie & N.Marchant
001101111111011. Petals broadly obovate, with pink spots
***D.parvula*** Planch.
0011011111110110. Innermost fringe of lateral lobes of stipule produced into seta up to 2 mm long, pedicels erect in fruit
***subsp.parvula***
0011011111110111. Innermost fringe of lateral lobes of stipule produced into 5 mm long seta, pedicels pendulous in fruit
***subsp.sargentii*** (Lowrie & N.Marchant) *comb. & stat. nov.*
0011011111111. Flowers more than 20, crowded, seemingly in several rows
***D.paleacea*** DC.
00110111111110. Scapes minutely glandular puberulent to glabrous
001101111111100. Petiole up to 5 mm long, petals obovate
***subsp.paleacea***
001101111111101. Petiole 10 mm long, petals lanceolate
***subsp.stelliflora*** (Lowrie & Carlquist) *comb. & stat. nov.*
00110111111111. Scapes with hairy pubescence
001101111111110. Scapes covered with eglandular pubescence
***subsp.trichocaulis*** (Diels) N.Marchant & Lowrie
001101111111111. Scapes covered with glandular pubescence
0011011111111110. Stipules 3-cleft, forming compact clusters
***subsp.leioblastus*** (N.Marchant & Lowrie) *comb.*

*& stat.nov.*

0011011111111111. Stipules multifid, forming loose clusters
***subsp.roseana*** (N.Marchant & Lowrie) *comb. & stat.nov.*

00111. Style abruptly widened into a flattened stigma or stigma clavate and widest near apex and lamina deeply concave

001110. Stigma clavate, not knob-like or ovate, lamina deeply concave

0011100. Styles 3, lamina elliptic, inflorescence with usu. more than 10 flowers
***D.rechingeri*** Strid

0011101. Styles 5, lamina circular, inflorescence usu. with fewer than 10 flowers
***D.occidentalis*** Morrison

00111010. Rosette loosely open with 5-8 leaves, scapes c. 1 cm long with 1- 2 flowers
***subsp.occidentalis***

001110100. Lateral lobes of stipules entire
***var.occidentalis***

001110101. Lateral lobes of stipules two-cleft
***var.microscapa*** (Debbert) *comb. & stat.nov.*

00111011. Rosette compact with 20-30 leaves, scapes c. 2.5 cm long with 1-8 flowers
***subsp.australis*** N.Marchant & Lowrie

001111. Style abruptly widened into stigma, stigma sometimes only knob- like or ovate, lamina shallow

0011110. Gemmae with warts at apex, stigma ovoid or knob-like

00111100. Stigma ovoid to oblong, inflorescence bracteate, gemmae flattened laterally

001111000. Style and stigma dark, flowers orange
***D.platystigma*** Lehm.

001111001. Style and stigma white, flowers white or pink
***D.mannii*** Cheek

00111101. Stigma knob-like, inflorescence ebracteate, gemmae flattened dorsiventrally

001111010. Styles 3
***D.hyperostigma*** N.Marchant & Lowrie

001111011. Styles 5
***D.sewelliae*** Diels

0011111. Gemmae with a stalked gland at apex, stigma peltate, circular or allantoid-reniform
***D.nitidula*** Planch.

00111110. Stigma allantoid-reniform
***subsp.nitidula***

001111100. Leaf lamina up to 2.5 mm long, orbicular

0011111000. Stigma reddish

00111110000. Stigma reniform
***var.nitidula***

00111110001. Stigma allantoid
***var.allantostigma*** (N.Marchant & Lowrie) *stat. nov.*

0011111001. Stigma white
***var.leucostigma*** (N.Marchant & Lowrie) *stat. nov.*

001111101. Leaf lamina 3-5 mm long, spathulate
***var.?***

00111111. Stigma circular

***subsp.omissa*** (Diels) N.Marchant & Lowrie

01. Lamina dichotomously branched, styles basally multipartite

***Subgen.Phycopsis*** (Planch.) *stat.nov.*

***D.binata*** Labill.

1. Plants with corms and/or leaves peltate, styles multipartite, stipules always absent

***Subgen.Ergaleium*** DC.

10. Leaves peltate, cauline, basal rosette sometimes present, lowermost leaf whorls not fimbriate-eglandular

***Sect.Ergaleium***

100. Leaves usu. not 3 together, stem glabrous, sometimes branching, sepals glabrous, if sepals not totally glabrous plants erect

1000. Sepals at least marginally deeply fringed and/or glandular or sepals pilose on the whole surface, if sepals glabrous lamina distinctively crescentic and plants less tan 0.5 m tall, few branched with few prophylls

10000. Leaves not crescentic, but sometimes reniform

100000. Sepals glandular throughout

***D.marchantii*** DeBuhr

1000000. Basal bracts few, flowers pink

***subsp.marchantii***

1000001. Basal bracts numerous, flowers white

***subsp.prophylla*** N.Marchant & Lowrie

100001. Sepal margins deeply fringed and/or glandular

1000010. Flowers usu. 5-merous, sepals deeply fringed and/or glandular marginally

10000100. Lamina campaniform-concave, pointing downwards

***D.huegelii*** Endl.

10000101. Lamina reniform, pointing horizontally outwards

100001010. Bracts present, inflorescence with up to 5 flowers, styles irregularly divided

***D.bulbigena*** C.Morrison

100001011. Bracts absent, inflorescence with more than 5 flowers, styles divided to base into c. 18 flattened filiform segments, c. 12 horizontal and upturning, the others erect

***D.radicans*** N.Marchant

1000011. Flowers with usu. 8 sepals, petals, and stamina, sometimes more, sepals marginally non-stalked glandular

***D.heterophylla*** Lindl.

10001. Leaves distinctively crescentic

100010. Bracts dentate apically, cauline leaves rarely developped

***D.insolita*** Taton

100011. Bracts not dentate apically, cauline leaves developped

1000110. Lamina of basal leaves transversely elliptic, flat, inflorescence 5-20 flowered, erect stem straight

10001100. Petioles of lower cauline leaves appressed to stem, 1-1.5 mm long, petioles of upper cauline leaves semierect, 4-7 mm long

***D.bicolor*** Lowrie & N.Marchant

10001101. Petioles of cauline leaves all semierect, 12 mm long

***D.peltata*** Thunb.

100011010. Seeds usu. narrow ellipsoid 0.3-0.5 mm long, basal unbranched part of style 0.1-0.3 mm long, sepals 2-4 mm long, hairy or glabrous, petals 5-6 mm long

***subsp.peltata***

100011011. Seeds narrow linear 0.5-1 mm long, basal part of style 0.3-0.5 mm long, sepals 3-6 mm long, glabrous, petals 5- 8 mm long

***subsp.auriculata*** (Backh.ex Planch.) Conn

1000111. Lamina of basal leaves flabellate, folded, inflorescence 1-2

flowered, erect stem flexuous

***D.salina*** N.Marchant & Lowrie

1001. Sepals totally glabrous, if lamina crescentic plants many-branched, up to 1 m tall with many prophylls

10010. Stem usu. branching and/or inflorescence branched, sepals not iridescent green

100100. Lamina crescentic or reniform

1001000. Lamina distinctively crescentic, more than 4 mm wide, uppermost prophylls without lamina, sepals more than 2 mm long, styles up to 0.8 mm long

***D.gigantea*** Lindl.

10010000. Leaves and lateral branches bent towards apex of branch or stem, stem erect

***var.gigantea***

10010001. Leaves and lateral branches sometimes bent towards base of branch or stem, stem flexuose

***var.geniculata*** (N.Marchant & Lowrie) *stat. nov.*

1001001. Lamina broadly reniform, less than 2 mm wide, uppermost prophylls with undevelopped lamina, sepals up to 2 mm long, styles longer than 1 mm

***D.graniticola*** N.Marchant

100101. Lamina orbicular

1001010. Inflorescence branched, petals 4-6 mm long, corm present

***D.myriantha*** Planch.

1001011. Inflorescence not branched, petals up to 4 mm long, corm apparently absent or inconspicuous

***D.subtilis*** N.Marchant

10011. Stem and inflorescence usu. not branched, lamina orbicular, sepals iridescent green

***D.microphylla*** Endl.

101. Leaves usu. 3 together, stem never branching or very rarely few- branched, sepals glandular-pilose throughout, if sepals glabrous plants climbing

1010. Styles divided to base and apically plurifid

10100. Basal leaf rosette present

***D.andersoniana*** Fitzg.ex Ewart & White

10101. Basal leaves absent

101010. Stem erect, lamina orbicular

***D.stricticaulis*** (Diels) O.H.Sargent

1010100. Basal adventitious stolons absent

***subsp.stricticaulis***

1010101. Basal adventitious stolons present

***subsp.eremaea*** (N.Marchant & Lowrie) *comb.nov.*

101011. Stem climbing or lamina crescentic

1010110. Lamina orbicular, petals yellow

***D.subhirtella*** Planch.

10101100. Sepals hirsute

***subsp.subhirtella***

10101101. Sepals glabrous

***subsp.moorei*** (Diels) N.Marchant

1010111. Lamina crescentic, petals white, pink, or pale yellow

10101110. Stem glabrous, sepals 5-7 mm long

***D.neesii*** Lehm.

101011100. Leaves yellow green, stem up to 1.5 mm in diameter, petals pale yellow

***subsp.neesii***

101011101. Leaves red, stem more tan 1.5 mm in diameter, petals pink

***subsp.borealis*** N.Marchant

10101111. Stem glandular, sepals 3-5 mm long

***D.modesta*** Diels

1011. Styles divided to base but not apically
10110. Petals obovate, white, corm white
101100. Lamina reniform
***D.erythrogyne*** N.Marchant & Lowrie
101101. Lamina circular
1011010. Stem glabrous, flexuose, sepals only marginally glandular, ovary red
***D.pallida*** Lindl.

1011011. Stem glandular pubescent, straight, sepals glandular pilose on whole surface, ovary green
***D.macrantha*** Endl.
10111. Petals cuneate, red, pink or rarely white ageing pink, corm red or pink
***D.menziesii*** R.Br.ex DC.
101110. Leaves at base of stem not crowded
1011100. Petals not white, sepals fimbriate
10111000. Stolon below ground up to 10 cm long, corm red
***subsp.menziesii***
10111001. Stolon below ground up to 45 cm long, corm white blushed pink
***subsp.penicillaris*** (Benth.) N.Marchant & Lowrie
1011101. Petals white, ageing pink, sepals distally fimbriate
***subsp.thysanosepala*** (Diels) N.Marchant
101111. Leaves at base of stem crowded, forming a closed cylinder
***subsp.basifolia*** N.Marchant & Lowrie
11. Leaves not peltate or lowermost whorls fimbriate-eglandular
110. Cauline leaves present
***Sect.Stolonifera*** DeBuhr
1100. Lowermost whorls of leaves fimbriate-eglandular, cauline leaves peltate
***D.fimbriata*** DeBuhr
1101. Lowermost leaves neither fimbriate nor eglandular, cauline leaves with the margins of petiole and lamina confluent
11010. Cauline leaves whorled, stigmas clustered in two groups, one erect, the other spreading horizontally
***D.stolonifera*** Endl.
110100. Lamina of the upper leaves obovate or reniform
1101000. Leaves and stems red, yellow-red, or dark green
11010000. Lateral branches erect or absent
110100000. Rosette leaves transversely elliptic, upper leaves with petioles up to 5 mm long
***subsp.stolonifera***
110100001. Rosette leaves spathulate, upper leaves with petioles 10-30 mm long
1101000010. Petals pink, secondary cormiferous stolons present
***subsp.monticola*** Lowrie & N.Marchant
1101000011. Petals white, secondary stolons absent
***subsp.compacta*** N.Marchant & Lowrie
11010001. Lateral branches prostrate
***subsp.prostrata*** N.Marchant
1101001. Leaves and stems light green or yellow-green
11010010. Leaves light green, lamina 5-8 mm long
***subsp.rupicola*** N.Marchant
11010011. Leaves yellow-green, lamina 2-4 cm long
***subsp.humilis*** (Planch.) N.Marchant
110101. Lamina of the upper leaves orbicular with a wedge shaped incision

***subsp.porrecta*** N.Marchant & Lowrie

11011. Cauline leaves not whorled, stigmas not grouped conspicuously into 2 groups

110110. Stems usu. 2, inflorescence arising from basal rosette
***D.ramellosa*** Lehm.

110111. Stems single, inflorescence terminal
***D.platypoda*** Turcz.

111. Cauline leaves absent, all leaves in flat basal rosette
***Sect.Erythrorhiza*** (Planch.) Diels

1110. Scapes many-flowered or leaves 2.5-10 cm long

11100. Scape single, cymose, erect in flower and fruit, leaves broadly spathulate or flabellate, up to 5 cm long

111000. Lamina broadly spathulate, green, red, or green with a red midrib
***D.erythrorhiza*** Lindl.

1110000. Midrib of leaves not raised

11100000. Flowering after leaves are well developed

111000000. Leaf lamina broadly obovate, almost flabellate 3 cm long and wide
***subsp.erythrorhiza***

111000001. Leaf lamina obovate, elliptic or oblong, to 6 cm long
***subsp.collina*** N.Marchant & Lowrie

11100001. Flowering before leaves develop
***subsp.squamosa*** (Benth.) N.Marchant & Lowrie

1110001. Midrib of leaves slightly raised
***subsp.magna*** N.Marchant & Lowrie

111001. Lamina flabellate, distal margin red
***D.zonaria*** Planch.

11101. Scapes 3-40 or if 1 prostrate in fruit, single-flowered or with up to 6 flowers, leaves spathulate to obovate, 2-10 cm long, often reddish

111010. Scapes erect in fruit, leaves sessile
***D.macrophylla*** Lindl.

1110100. Scapes 2-4-flowered
***subsp.macrophylla***

1110101. Scapes 1-flowered
***subsp.monantha*** Lowrie & Carlquist

111011. Scapes prostrate in fruit, leaves petiolate
***D.prostratoscaposa*** Lowrie & Carlquist

1111. Scapes single-flowered, rarely 2-flowered, leaves 0.8-3.5 cm long

11110. Petals 5-10 mm long, leaves entire

111100. Midrib of leaves raised

1111000. Styles short, tubaeform
***D.tubaestylis*** N.Marchant & Lowrie

1111001. Styles filiform

11110010. Styles divided, scape erect in fruit, flowering at the end of the rainy season
***D.browniana*** Lowrie & Carlquist

11110011. Styles entire, scape secund in fruit, flowering at the beginning of the rainy season
***D.bulbosa*** Hook.

11110010. Calyx punctate, lamina to 2.5 cm long
***subsp.bulbosa***

11110011. Calyx not punctate, lamina up to 5.5 cm long
***subsp.major*** (Diels) N.Marchant & Lowrie

111101. Midrib of leaves depressed

1111010. Leaves obovate, almost sessile
***D.rosulata*** Lehm.

1111011. Leaves spathulate or orbicular, petiolate
11110110. Leaves spathulate, petioles gradually broadening into lamina, crowded more than 10
***D.lowriei*** N.Marchant
11110111. Leaves orbicular, petioles abruptly broadened into lamina, 4-6
***D.orbiculata*** N.Marchant & Lowrie
11111. Petals 10-12 mm long, leaves crenate-dentate apically
***D.whittakeri*** Planch.
111110. Plants without stolons
***subsp.whittakeri***
111111. Plants with cormiferous stolons
***subsp.aberrans*** Lowrie & Carlquist

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Note added in proof:
Thanks to Fernando Rivadavia who has informed me about the recent publication by Duno & Culham (1995), the thorough discussion of which having led to a revision (and, as is hoped, improvement!) of the key (in ***sect.Oosperm***a).

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# International Carnivorous Plant Conference May 16-20, 1997

hosted by
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Held at The Atlanta Botanical Garden, Atlanta, Georgia, USA

Proposed Agenda

| | |
|---|---|
| **Thursday, 15 May** | |
| 6.30pm | Welcome buffet & late registration |
| **Friday, 16 May** | |
| 8.00am-6.30pm day | 6 Speakers from around the world featured throughout the followed by a poster session, plant sale (only artificially propagated plants) and ABG cp collection tour |
| **Saturday, 17 May** | |
| 8.00am-5.00pm | 6 Speakers throughout the day followed by ABG cp collection tour |
| **Sunday, 18 May** | |
| 8.30am-3.45pm | 6 Speakers throughout the day |
| **Monday, 19 May - Tuesday, 20 May** | Two day field trip to visit cps in Georgia and surrounding states |

## Registration

Registration will cover welcome buffet, continental breakfast, breaks and box lunch and drink throughout the conference

*Registration **$65.00**
*Field Trip (limited to 50 places) **$120.00**(inclusive of accommodation, travel and food)

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Please address inquiries to:
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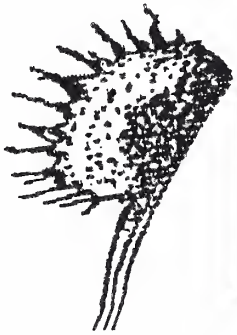

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# THE SAGA of *Dionaea muscipula* 'ROYAL RED'

by
Colin H. Clayton ( Dingley Home & Garden, 233 Centre Dandedong Rd., Dingley, Victoria 3172 Australia)

Horticulture is advancing along with other technology at an ever-increasing rate. Plant breeding has become big business with multi-national companies devoting considerable time and funds to research in order to find better food, fodder, flower, forest and ornamental plants. To protect their huge investments, "Plant Breeders Rights" or P.B.R. (formally known as "Plant Variety Rights" or P.V.R.) has been set up world wide. Simply put - it gives the plant breeder the exclusive rights to produce and sell - including the right to license other persons to produce and sell - plants and reproductive material of a registered variety. This legislation is accepted in the world of horticulture as something we must have to advance us into the 21st Century.

However, in Australia a series of mistakes has been made by the Administrator of the Act which will affect the world of carnivorous plants for years to come - and here's the story of how it came to be.

In 1978, Mr. Stephen Jackson imported some *Dionaea muscipula* seed from the U.S.A. From this arose color variations which included an all red form. In 1950, Mr. Ian English also imported seed from the U.S.A. Again an all red V.F.T. occurred. From these two sources "all red" V.F.T.'s were bought, sold and swapped in small numbers for many years. This brought to light the first mistake by the P.V.R. authority, that "all red Fly Traps"had already been sold before the application for a P.V.R. had been applied for. The next stage came when G & G Carnivors obtained some seed of an all red V.F.T. from Mr. Paul Kane who had pollinated his red V.F.T. which had originated from Stephen Jackson. This seed was raised invitro and multiplied in flasks under sterile conditions. Upon deflasking. Geoff Mansell now of Exotica Plants applied for a P.V.R. The law states that a qualified person must conduct or supervise trials to establish whether the plant being trialed is distinct from an already known type, before being granted a P.V.R. It was here that the major mistake was made. The chosen qualified person - Dr. Charles Clarke - was given a red petioled V.F.T. and an all green V.F.T. to compare it with. After the scientific growing trials (growing the all red V.F.T. alongside the green one), the conclusion was that the red V.F.T. was different from the green one - so the P.V.R. was granted.

Dr. Lloyd, the Registrar of P.V.R., points out in subsequent correspondence that. "The definition of a new variety (Section 3) in conjunction with Section 26 establishes that there is no absolute requirement under the old Act for the inclusion in the trial itself of all most similar varieties of common knowledge." This disaster to the carnivorous plant world has now happened and anyone world wide trading or selling or propagating a red petioled Venus Fly Trap is liable to prosecution and the penalties are severe for infringement of the Act.

Conclusion:

The injustice of this is that to gain the P.V.R. all Exotica Plants had to do was grow an all red V.F.T. alongside a green V.F.T. So now if anyone - from the backyard hobbyist to the large commercial grower - wishes to sell any clone of an all red V.F.T. they must prove it is not the same as "Royal Red". The only test that would stand up in a Court of Law would be to have the DNA analysed and compared to "Royal Red". Clearly this is beyond all but the largest organization's ability to finance, so it precludes the carnivorous plant club member from trading in any all red V.F.T.'s for many years to come.

Postscript:

Maybe the carnivorous plant world was lucky. What would have happened if they had applied for a P.V.R. on a green V.F.T.? Think about that!

# ICPS SEEDBANK

Tom Johnson, Coordinator
PO BOX 12281
Glendale, CA 91224-0981
Updated JULY 09, 1996

Byblis gigantea
Darlingtonia californica
Dionea muscipula
Drosophyllum lusitanicum
Pinguicula lusitanica Ltd
Utricularia bisquamata
U. subulata
S. flava
S. flava "purple throat"
S. leucophylla
S. psittacina
S. purpurea purpurea
S. purpurea venosa Ltd
S. rubra
S. rubra gulfensis
S. X alata x leuco
S. X flava x (alata x leucophylla) Ltd
S. X leucophylla x (flava x leucophylla) Ltd
S. X (leucophylla x flava) x (leucophylla x rubra) Ltd
S. X (oreophila x purpurea purpurea) x self
S. X purpurea x alata Ltd

Nepenthes X fukabusana x hookerae Ltd
Drosera adelae
D. binata "North Plains, NZ" Ltd
D. brevifolia "Hampstead, NC" Ltd
D. burmannii "Berwah, Qld
D. capensis
D. capensis "red"
D. capillaris
D. filiformis filiformis
D. indica "grn plant, red flowers"
D. intermedia
D. intermedia
D. intermedia "Carolina Giant"
D. macrantha macrantha
D. marchantii marchantii
D. planchonii
D. spatulata Formosa "White Flower"
D. spatulata pink flower
D. species Magaliesburg
D. stolonifera stolonifera
D. X dielsiana x Sp. Transvaal

All seed contributions are gratefully accepted. Please forward to the above PO Box. Please protect the seeds from postal abuse. I use bubble wrap, although it does require an additional eleven cents in postage (within US). Note: Ltd. means the seeds are in very limited supply.

PLEASE INCLUDE A SELF-ADDRESSED-STAMPED ENVELOP WITH ALL U.S. CORRESPONDENCE ($.32 Postage for seedlist ; $.43 when ordering seed) IRC or $1.00 if foreign $1.00/packet Please list substitutes

Please mail comments to: tjjohns@primenet.com

** **International Meeting Update** **

Dr. Kondo has confirmed to talk at the International meeting in Atlanta in May 1997. More to come soon on others to talk at 1st ICPS meeting.

# News & Views

**Bruce Lee Bednar**, (PO Box 669, Labelle, FL 33935)

The status of *Nepenthes* hybridization in Florida. Since the 1992 hurricane that devastated south Florida, *Nepenthes* growers have worked hard to rebuild their collections. We have started back adding to the "hybrid cross" list which ended at hurricane Andrew. By the fall of 1993, the plants were looking normal again and Clyde Bramblett recrossed N x 'Andrewensis' by using N x 'Margaretea' with his giant male *N. khasiana*. Although the same parent clones were used, germination was poor; the year before he had a great germination rate.

Late in 1993, John Banta of Alva, Florida made his second cross of *N. khasiana x edinensis* and seed germination was fair. John's first cross back in 1990 was *N. khasiana* x Ron Determann's 1st cross of *N. ventricosa x khasiana*, produced back at Selby Gardens.

Manny Herrara of South Miami used pollen from Bramblett's giant *N. khasiana* and crossed it to his female *N. mirabilis* cv Lecoufle in 1994. Germination was fantastic and Manny named the cross after himself, N x 'Manny Herrara'.

Finally, after several unsuccessful cross attempts, Bruce Bednar gerninated a new hybrid in August of 1995, N. x 'margaretea x LeeAnn Marie'. Earlier in 1995, Clyde Bramblett crossed N. x 'margaretea' x *mixta superba* but only a few seedlings survived and germination was poor. Later that fall, Clyde produced pure seed of *N. khasiana* and seed germination was great. In 1995, Clyde got around to naming his 1985 hybrid cross of *N x oisoensis x mixta* ? and now is called N. x 'David Parkyn'. Bramblett's and Bednar's cross of *N. x splendiana x redlanderii* made in 1989 was named N. x 'East Everglades'.

Finally, in December of 1995, seed germinated of a cross by Bednar, with parents of N. x 'dianiana x fulgent koto'. South Florida is back in gear. I will keep you posted on future hybrids.

**Yukio Koshikawa**, (Nansow Insectivorous Plants Botanical Gardens, 4-42-8 Shimotakaido Suginami-Ku, Tokyo 168 Japan.)

Word has been received about the test botanical garden dedicated to CP, opening in Japan in 2000. It is called the NANSOW INSECTIVOROUS PLANTS BOTANICAL GARDEN, or NIP Botanical Garden for short. It is located in Maruyama Town between Chikura Town and Kamogawa City on the Minami Boso Peninsula, about two hours drive from Tokyo. For the time being, the garden is open provisionally to members of any CP society or club around the world.

The Garden is on 130 acres and ultimately will feature naturalized CP (appropriate to climate) and greenhoused exotic CP as well as extensive propagation facilities since visitors and members will be given free plants and seed as well as the opportunity to buy others. The ultimate number of display plants will be in the hundreds of thousands. At present, there are 5000 naturalized sarracenia plants. Watering of sarracenias and *Darlingtonia* is by flowing water pumped from the ground by a windmill.

In addition to the plants, there will be rental cottages, camping, a sports hall and a music hall. A newsletter will be published two to four times a year, featuring articles in Japanese and English and photos.

Keeping in mind a yen/dollar (US) exchange rate as of this writing of approximately one yen equalling one cent (US), life memberships are 20,000 yen which includes unlimited free visits with seeds and plants and the newsletter. Admission fee, which includes one sarracenia for non-members is 1000 yen, tent rent is 500 yen, cottage rental is 2000 yen. Those not living in Japan may become corresponding members for five international postal reply coupons. For this, you will receive the newsletter, five *Aldrovanda* turions, and unlimited garden admission for the year should you visit the Tokyo region.

**Joseph Yeo**, (60 Toh Tuck Road, #02-08, Singapore 596723, Republic of Singapore)

Presently, I am also rooting *Nepenthes* in water. I have tried and succeeded in the following species, *N. ampullaria, rafflesiana, alba, trichocarpa, gracilis, hookeriana*, x *coccinea*, x Holland hybrid, *gracilis x rafflesiana* (natural hybrid). As you mentioned, the strike rate varies from species to species. The hybrids tend to root more easily. The Holland hybrid and x *coccinea* start to root as early as one month and they have 100% strike rate. I am now trying this method with some highland cuttings. They have been sitting in the water for about 5 weeks and the cuttings still look all right.

Figure 1. *Nepenthes sanquinea*, Fraser Hills.

**Joseph Yeo**, (60 Toh Tuck Road, #02-08, Singapore 596723, Republic of Singapore)

It is November 1995 and also the school vacation . My family decided to spend some time in the highlands of West Malaysia.

Fraser's Hill, Genting Highlands and Cameron Highlands are several hill resorts in West Malaysia. Incidentally, these are also the highlands mentioned in Shiva's 'Pitcher Plants of Peninsula Malaysia and Singapore'. The book indicated that there are several endemic highlands *Nepenthes* that are found on these mountains, namely, *N. gracillima, macfarlanei* and *sanguinea*.

Unfortunately, we have to give Cameron Highlands a miss as the road leading to the mountain was not passable due to land slides. The drive from Singapore to the foothill of Fraser's Hill took about 6 hours. The Gap is the starting point to an 8 Km one way winding road drive to Fraser's Hill. There is control gate for one-way traffic to the hill resort which is open from 6.30 AM to 7.00 PM, odd hours for up-hill traffic and even hours for downhill traffic flow.

Armed with a map of the resort, we decided to explore the surroundings the next morning. Fraser's Hill is also a haven for bird watchers. More than 230 species of birds which make the forest surrounding of this resort their breeding ground. Some species stop over at the hill while migrating from Siberia to the warmth of Australia. April to June is the best time for bird watching here as it is also the mating season.

Wild orchids can be seen growing epiphytically on trees. The first *Nepenthes* we spotted was *Nepenthes sanguinea*. It was growing high on a hill slope exhibiting several upper pitchers. Subsequently, only sanguineas were spotted on several sporadic locations. Most of the plants were less than 5

Figure 2. *Nepenthes sanquinea* , Genting Highland.

meters tall. Unlike the lowland species which usually can be found growing in patches.

The next morning, we drove to Genting Highlands. It is the most developed mountain resort in Pahang. It boasts of 4 - 5 star hotels with a casino, theme park and artificial lake for boating and a country club complete with an 18 hole golf course.

Here again, we managed to locate only *N. sanguinea*. They can be found growing on hill slopes and road embankments leading to the casino. The biggest patch of sanguineas we found was a 150 meters stretch of wet hill slope and some parts were even waterlogged. There was a plant which resembles gracillima by the leaves structure. As there were no pitchers so we could not really confirm it. The largest sanguinea' s lower pitcher spotted was about 30 cm high and 6 cm across on the peristome. A comparison with my size 9 shoe is shown in the attached photograph.

After lunch ,it was a 5 hours drive back to Singapore from Genting Highlands. From the field trip to the highlands, I would say that *N. sanguineas* is the most common of the West Malaysian highland species . Hopefully, we would venture to the other mountains for the other two highland species in the near future.

# An addition to Adrian Slack's Comment on *Nepenthes burbidgeae* (Improbable) Cuttings

by

Olivier Marthaler
Tilleuls 7
2300 La Chaux-de-Fonds
Switzerland

**Warning: This report has no scientific value whatsoever!**

Ever since I was a teenager, my interest in carnivorous plants has been quite great. Accordingly, the first book I could get hold of was the French version of Adrian Slack's "Les Plantes Carnivores" ("Insect-Eating Plants and How to Grow Them"), translated into French in 1988. I have never had any direct news from Adrian and all I have heard about him since that time is that he has been suffering from severe illness.

Obviously, when one is a kid and has wild fancies on any subject, the one I was most interested in was *Nepenthes burbridgeae*.Why that one? Because Adrian wrote: "Quant à *N. burbidgeae* sa réussite est si improbable [as a cutting] qu'il vaut mieux y renoncer (...)". Why more difficult to root it than other species? Far from being a scientist, I kept wondering about Nepenthes' inequalities in the field of rooting, as well as social inequalities...

So as years went by, I kept enlarging my Nepenthes collection thanks to German, American and Australian friends, who either gave, sold and swapped plants/seedlings/ seeds with me. So, also let this report be an indirect way of thanking them on that account.

Back to Adrian Slack, The ideal challenge I have always kept in mind was to root a cutting of *Nepenthes burbidgeae*. Maybe some people have succeded in rooting that species before me, but I have never found anything in literature about that specific topic so far. Why do not people share their experience on such terribly endangered species? In addition, I have never heard about anybody having obtained seed of that species. So let us keep it alive!

Last Autumn, a German friend of mine very kindly gave me an unrooted cutting of that species with three nodes on it. He told me it was easy work to root it (had he tried before? I didn't bother to ask him!), and ingenuously I tried so...

Since I had already made several attempts to make cuttings of many species before (with rather uneven success), I was a bit doubtful as to how that small stem with

few leaves would infirm Adrian Slack's lines on that species, asserting it was probably easier to try to aerial-layer it.

Technically speaking, I first put the cut part of the stem into fungicide for approximately 5 minutes, then, after drying it, I put it into rooting-hormone preparation made by a German friend.

I followed the excellent advice of a Californian friend of mine who urged me to give the cutting 24 hours a day of artificial light. With 2 Triton tubes of (THORN EMI plc) 20 centimeters from the cutting, the *N. burbidgeae* needed approximately two months to develop tiny roots which, five months after I put the plant into a regular compost (1/5 fine-chopped bark, 1/5 quarz-sand 5 mm in diameter, 3/3 German peat), has grown 5 cm long roots. However, for ecomomical reasons (Swiss electricity, as everything over here, being awfully expensive!), I only gave the cutting 20 hours of light daily. The plant is in an aquarium 40x15cm large and 30 cm high. There is water in the bottom (approx. 5 cm.) and the pot holding the cutting stands on an upside-down pot. Daily temperature is about 25°C and night 10-18°C. The aquarium is set on a north-west windowsill, slightly open at night, and is covered with a 3 mm thick piece of glass. The electric tubes "rest" on the whole thing. I spray the inside of the aquarium twice a day and the plant now looks good, even if it is a bit sun-burnt. Quite normal with one-metre thick snow refleton from outside!!!

In conclusion, I shall state that the season when one makes a cutting apparently does not matter, as long as one has artificial light and can regulate temperature and humidity. Since I have absolutely no knowledge of botany, biology or any scientific background, what I would like to point out is that growing and reproducing such an apparently difficult plant as *Nepenthes burbidgeae* is possible for any ignorant, provided (s)he has the right conditions.

Adrian, wherever you are and whatever you are doing at the moment, thanks a lot for letting your passion get in!

---

# *DROSERA*

by

Joe Mazrimas
329 Helen Way
Livermore, CA 94550

After you have been growing CP for many years, you begin to have a certain liking for one set of plants over another. I confess that I find myself liking to grow and observe certain *Drosera* more than others.

First, I like a plant that grows rapidly and large, grows in my conditions all year without going into serious dormancy and is easy to take care of in any weather condition throughout the year. I also like a plant that doesn't need repotting very often, that puts out a beautiful set of flowers that are large and colorful. Minimum care and good results are two qualities that attract my attention to my favorite species *Drosera regia*.

I obtained this plant which I got from Califonia Carnivores several years ago growing in a six-inch(15 cm) pot in living spagnum moss. The plant sits in an inch(2.5 cm) of water throughout the growing season and seems to like the moisture provided. of this *Drosera* is now about 0.5 inch(1.2 cm) in diameter and about 2 inches(5 cm) tall where the giant leaves emerge from the growing point. A couple of thick roots emerge from this stem to support the plant upright and arch into the sphagnum moss. These roots are 0.25 inch (6 mm) thick and are black in color except for the tip which is pale yellow! The strap-shaped leaves in the summer grow to a length of 18-22 inches( 45cm-55cm) long and it is a beautiful sight to see about 15 of these leaves arch over the plant with the tips falling over the sides of the pot. In the early morning the tentacles tips

are covered with dewdrops. The whole plant looks like something from another planet. I can imagine looking at an acre of these plants which grow native to South Africa being a sight to behold. The plant puts out several flower stems at a time with each stem bearing 15-20 magenta flowers up to 1 inch(2.5cm) across. Each flower opens every day starting from the lowest and moving to the top of the stem. The entire stem may be 2 1/2 feet(75 cm) tall after the last flower opens. The growth of the flower did not seem to affect the growth rate or size of the plant during the blooming period nor when seed was set.

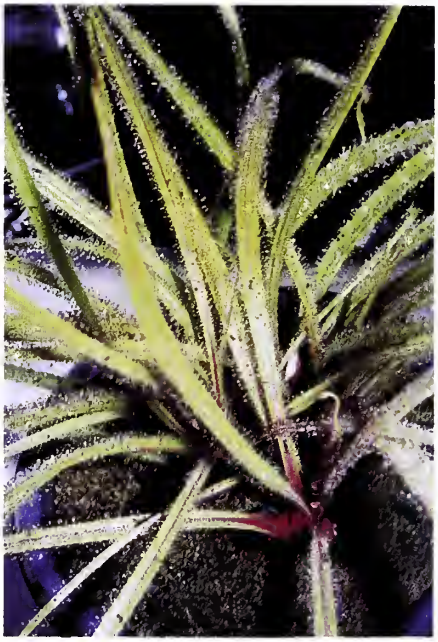


Figure1. *Drosera regia.* Photo by Joe Mazrimas.

The leaves of this plant are trapping mosquitoes, gnats and flies by the dozens every day. This nourishment is essential for a plant to be growing such large leaves. This plant does not like disturbance of its roots so I do any transplanting in December when growth is minimal. It is a good idea to do this job carefully and with minimum disturbance of the root ball. The roots are thick and rather brittle and break off easily like a skinny carrot. If this should happen you can plant the root to obtain another plant. Its a good idea to use the largest pot available since this plant will grow rapidly.

I am amazed that this plant can survive some really cold temperatures in winter without going into a dormant condition. Temperatures of 28 degrees F(-2 degrees C) in the early mornings did not affect the plant. In the winter the leaves grow shorter-about half the size of summer leaves. This is probably due to photoperiod being shorter in winter than summer. I'm glad that I can look at a plant that is green in winter when everything else is brown or dormant. The plant even traps insects in winter since it seems it has a powerful attractant in the mucilage that can attract insects from a distance. Similar *Drosera* growing nearby such as *Drosera slackii* and *Drosera pauciflora* do not seem to have this capability.

A runner-up to my favorite plant is *Drosera slackii* which is a beautiful rosetted *Drosera* with thick, wide leaves that stretch out to the pot's edge. This plant grows to a diameter of 4 inches(10 cm) or more as it ages. It is also a hardy plant in the cold winter and does not seem to go dormant for me at this time. I allowed this plant to have flowers once but I won't do this again because it took nearly all the energy out of the plant and didn't recover for 6 months or more. So now I snip the young buds off when I see them.

This plant sits in a sphagnum peat-perlite-sand mix of equal proportions and sits in a inch of water throughout the growing season. I give it less in winter. As noted above, it doesn't trap many insects in Winter so I spray its leaves with a fine mist of Miracle-Grow solution for acid plants made up to 1/2 strength New growth seems to respond to this stimulus. I apply this every 3-4 weeks or so. The tentacles of the plant and the edges of the leaves curl inward in response to this stimulus.

Well, that's my story on these plants and I'm glad to grow them. In the future, I will relate a story on my other favorite plants from other genera.

# Literature Review

**Chapin, Car. and J. Pastor.** 1995. Nutrient limitations in the northern pitcher plant *Sarracenia purpurea.* Can. J. Bot. 73:728-734.

The authors preface their studies by noting that fertilization and nutrient budget studies of CP are rarely done. (Ed. note--There have been some good ones). Plants in the field were treated with various combinations of nitrogen and phosphorus compounds, controls and insects, and noting counts of pitcher formation over four months of summer as well as leaf quantitation of nitrogen and phosphorus compounds at the conclusion of the experiment (plants were thus sacrificed). Insect exclusion, where desired, was accomplished with glass wool. Rain was also a passive treatment, and artificial treatments were applied once at the beginning. The studies indicate to the authors that the plants acquire only 10% of their total N and P requirements from leaf capture. (Ed. note--This study is seriously lacking and one must read the whole paper to appreciate this; quoting the abstract is very misleading. For one thing, potassium should also have been studied in conjunction with N and P compounds and the micronutrient mix that was used in their various combinations. Several studies have suggested that K may also be limiting. Concentrations of applications were at best arbitrary. Many pitchers, as the authors noted, suffered from the glass wool plugging. Also, the authors completely failed to take into account possible rhizome storage and tapping of such stores during environmental and experimental deficiencies with possible movement of N and P to the leaves. The most glaring error is doing such an experiment on the plant set only one season--What effects on future pitcher growth over the next several seasons? How about flowering over several seasons? Seed yield? Where are the vaulted reviewers and referees when you need them?)

**Haines, Arthur**. 1994. Key to the genus *Utricularia* (Lentibulariaceae) in Maine, based on vegetative characters. Maine Naturalist 2:47-49.

The author presents a key to utricularias in Maine based on vegetative characters in case flowers are missing from specimens being examined in the field or in herbaria. (Ed. note-- The obvious question is, why state keys for this genus anyway? Suppose something new for the region, state, etc. is found? Would not one want a nationwide key? The genus is not that large that a national key is unmanageable. There are errors. *U. vulgaris* is mistakenly used for *U macrorhiza*. Also, inclusive sets of numbers do not contrast well in a key. Differentiating something based on "usually 2 (that is, 0-2 inferred)", and 0-4 is not helpful. If you have limited material and the number of the character in it is two, is it in the 0-2 or the 0-4 set?

v . .

The author's bibliography is glaringly deficient. Taylor's 1989 opus apparently was not obtained and studied for this, let alone cited-This is unacceptable in this kind of work. Your best bet for both floral and vegetative keys is the nationwide one by Taylor in CPN 20:8-20, 1991).

**Krabulcová A. et Jarolímová** V. 1991. Relationship between *Pinguicula bohemica* KRAJINA and *Pinguicula vulgaris* L. (Lentibulariaceae) from the karyological point of view. Preslia, Prague, 63: 323-328.

An article about the same subject has been published in CPN (Studnicka et Hejny, CPN 21: 64-67). This is to compare both papers, because there is a discrepancy in conclusions. According to Krahulcová and Jarolimová, 2n is 64 chromosomes in

*Pinguicula bohemica*, but according to Studnicka and Hejny 2n=32.

There is a question, of different ploidy levels within the species. That phenomenon is known, e.g. in *Helianthus decapetalus* (2n=34 and also 68), *Coreopsis lanceolata* (2n=24 and also 48) and many other plants. Comparing photograph 1a and the proper explanatory diagram in the article by Krahulcová and Jarolimová (p. 326), one can easily discern two suspicious clues: 1) The chromosomes in the upper left corner and also in the lower right corner belong to adjoining cells (the cell wall of the central cell is evident), 2) the authors included several times more deeply coloured parts of the same chromosome as different chromosomes.

The explanation given by Krahulcová and Jarolimová, that 2n must be 64, was probably deduced from fixed agreement with authorities, which take for granted a close relationship of *P. bohemica* and *P. vulgaris*.

---

# ATTENTION

Phil Mann is attempting to compose a list of Nepenthes Species and hybrids as a reference to named species, hybrids and cultivars but he need any input that anyone has available. He hope to be able to offer the reference list for the cost of a disk and postage. So far there is a composite list of 23 pages. Any information to Phil Mann, P.O. Box 193 Harvey, 6220, West Australia.

## "Important Notices"

In the source list from the June 96 issue of CPN we need to make a address correction. It should read as follows:

Orgel's Orchids
18950 S.W. 136th Street
Miami, Florida 33196

Dionaea muscipula 'Akai Ryu' Distribution

Ron Gagliardo, Atlanta Botanical Garden

Just a quick word of thanks to those who purchased our new all red Dionaea. The response was terrific and the support of our conservation program very much appreciated. We're looking forward to the next distribution and will post it in a future CPN. Thanks again and I hope everyone enjoys there plants! Ron Gagliardo

# Call for ICPS Nominations

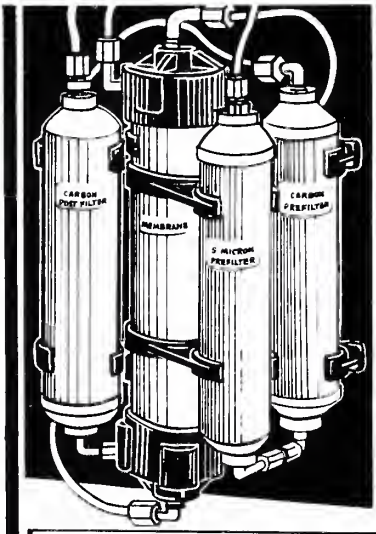
The ICPS is requesting nominations for President, Vice President, Secretary and Treasurer. The current terms will expire at the end of the calendar year.

Each ICPS affiliate group is encouraged to suggest one or more candidates. Candidates should be contacted prior to nomination, and a 1-2 paragraph platform statement by the candidate should be included for publication with the ballot.

Election Timeline:

| | |
|---|---|
| September 1 | call for nominations is advertised in CPN |
| October 15 | nominations and candidate statements must be postmarked by this date and arrive at ICPS by October 21 for inclusion in the ballot |
| November 1 | ballots mailed to current members |
| December 1 | ballots must be postmarked by this date, and arrive to ICPS to by December 8 to be counted in vote. |
| December 25 | election results distributed in Dec. CPN |
| January 1 | new officers installed in office |

Send nominations to: ICPS c/o Steve Baker, Rt 1, Box 540-19AB, Conover, NC 28613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